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FARMLAND UTILIZATION AND CROPPING STRATEGIES DURING A WORLD FOOD CRISIS: A CASE STUDY OF RICE PRODUCERS IN THE LOWER SENEGAL RIVER VALLEY

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ABSTRACT This study entailed an empirical investigation of farmland utilization and cropping strategies under conditions of a sharp increase, followed by a collapse, in rice prices. The results are based on a field survey conducted by the author in Village T in the Lower Senegal River Valley, the center of rice production in Senegal. This paper first discusses the exploitation and rehabilitation of farmland under conditions of increased rice prices, along with agricultural programs of the Senegalese government. Increased rice prices and the implementation of programs allowed villagers to reinforce a foundation for their livelihoods through collective effort. Next, the paper describes farmland utilization and farming expenses under conditions of price increases and collapse and demonstrates how the villagers use rice as a subsistence crop and plant tomatoes as their main cash crop to ensure their own food security. The results reveal that the villagers have planned several alternatives and apply these options under specific political, economic, or social conditions.

Key Words: Agricultural finance; Domestic production; Livelihood strategy; Rice; Senegal.

INTRODUCTION

International prices of major cereals (rice, wheat, and maize) increased sharply from the end of 2007 to the middle of 2008. In African countries, where demand for rice and its import have expanded in recent years, increases in international rice prices resulted in food insecurity. Surprisingly, international rice prices remain nearly 50% higher than the 2007 average even though international maize and wheat prices have now returned to pre-spike levels (Childs & Kiawu, 2009; FAO, 2010). In addition, the price of imported rice in Africa's domestic markets has declined more slowly than that in the global market (FAO, 2009b). The high cost of rice in Africa's domestic markets remains a matter of grave concern for vulnerable people who spend a large part of their incomes on food.

Rice is the main cereal consumed in Senegal⁽¹⁾, and the Senegalese faced a particularly difficult situation. The price of imported rice in Dakar markets rose from 220 F CFA⁽²⁾ per kg in August 2007 to 469 F CFA per kg in September 2008 (CSA, unpublished database). The price of imported rice has declined since January 2009, but in July 2010, it was still 298 F CFA. The price increase hit the Senegalese population hard, particularly urban residents who depend on imported rice for their daily diet.

Under these difficult conditions, the Senegalese government enforced two agricultural programs: the Grand Agricultural Offensive for Food and Abundance (la Grande Offensive Agricole pour la Nouriture et l'Abondance: GOANA; Sénégal,

2008)⁽³⁾ and the National Program of Self-sufficiency in Rice (Programme National d'Autosuffisance en Riz: PNAR; Sénégal, 2006; 2007)⁽⁴⁾. The GOANA program oversees special programs for agricultural products (e.g., cassava and groundnut) and gives top priority to the PNAR program. A specific goal of GOANA and PNAR is to increase rice production, with strategic goals that are classified into five principal categories: increasing rice cropping area by exploiting and rehabilitating rice-paddy fields and increasing nominal area by encouraging rice double cropping; continued subsidy for fertilizers and agrichemicals; facilitation of financing for rice production and necessary equipment; reinforcement of producers' capacities through training; and facilitation of rice commercialization. International aid agencies, including the World Bank and several countries, have invested large sums to support these projects in the Senegal River Valley.

The price of paddy rice produced in the Lower Senegal River, the center of rice production in Senegal, rose at the end of 2007 in synchrony with the sharp increases in the price of imported rice. One bag of paddy rice, which weighs about 84.6 kg, was 8,000–10,000 F CFA before the rice price increase, but 10,500–15,000 F CFA in 2008 (based on interviews with rice producers and private rice merchants in the Lower Senegal River Valley). At the beginning of 2009, the price of paddy rice dropped to 4,000 F CFA. Rice producers were hit hard because they could not sell the harvested paddy rice to private merchants even if the producers agreed on a price of 4,000 F CFA⁽⁵⁾.

African governments and international aid agencies have worked hard to encourage food security and increased rice production in Africa⁽⁶⁾. Many scholars have used national or regional statistics to document the food insecurity and poor rice production in Africa. However, these analyses are unavoidably superficial because they are based on data that are simply national or regional holistic summations. For example, Bâ (2008) analyzed Senegal's food security by analyzing food-grain production, agricultural policy, and international support for all of Senegal based on national and regional data. Thus, he failed to reveal the fact that Senegalese peasants do not place the highest priority on food security for the nation, but rather on their own food security and survival. What seems to be lacking in this kind of analysis is the perspective of African peasants.

African peasants translate a set of assets (e.g., capital, land, or labor) into a livelihood strategy composed of a portfolio of activities mediated by a number of contextual politic, economic, social, and natural considerations (Ellis, 2000). Through this livelihood strategy, they can cope with their own food insecurity and ensure their own food security (cf. Hosomi et al., 1996). These contextual considerations vary, so peasants' assets and access to assets vary; consequently, their livelihoods and livelihood strategies differ. Therefore, it is important to accumulate case studies about the diverse livelihoods of various African peasants.

This study entailed an empirical investigation of farmland utilization and cropping strategies under conditions of a sharp increase, followed by a collapse, in rice prices. This paper begins by outlining the research area, the Lower Senegal River Valley and Village T. Next, it discusses the exploitation and the re-utilization of farmland during the increased price of rice in 2008. Finally, it focuses on farming expenses and cropping strategies under conditions of price increases and

collapse. The data used in this study were mainly gathered during field surveys conducted by the author in Village T over a period of about 24 months (August 2004–February 2005, December 2006–February 2007, December 2008–January 2009, and July 2009–June 2010).

RESEARCH AREA AND PEASANT ORGANIZATION

Village T is an agglomerated settlement of Wolof people with 1,122 inhabitants in 134 households (123 male and 11 female heads of household). This village is located in the Lower Senegal River Valley and is administered by the Communauté Rural de Ross-Bethio, Arrondissement de Ross-Bethio, Département de Dagana, Région de St. Louis (Fig. 1). The Lower Senegal River Valley has three seasons: a 3-month rainy season (late July–early October), a 4.5-month cold dry season (late October–February), and a 4.5-month hot dry season (March–early July). Annual rainfall in the town of Ross-Bethio, adjacent to Village T, ranged from 49 to 336 mm from 1972 to 2003, with an average of 217 mm (SAED, unpublished data). Peasants in the Lower Senegal River Valley generally cultivate rice in the rainy and/or the hot dry seasons, and tomato or onion in the cold dry season.

Although the area receives little rainfall, flooding of the Lower Senegal River and its tributaries has produced rich soil and has formed a floodplain and alluvial delta (Fig. 1). Since 1934, the colonial government and later the Senegalese government worked to expand and improve irrigation systems for rice cultivation

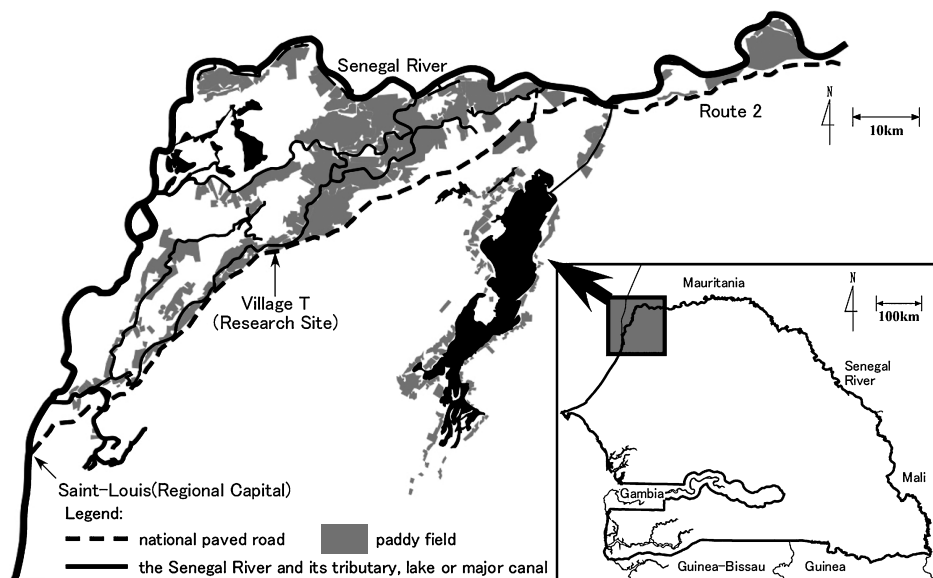


Fig. 1. The Lower Senegal River Valley.

Source: SAED & Direction du Développement et de l'Aménagement Rural (DDAR) 2008. *Les Aménagements Hydro-Agricoles de la Délégation de Dagana: Classification par Type*, SAED & DDAR, St. Louis.

in the floodplain of the Senegal River and to implement measures for domestic rice promotion. Consequently, the Senegal River Valley, particularly the Lower Senegal River Valley, has become the center of Senegal's domestic rice production (SAED, 1998; Bonnardel, 1992). Tomato and onion crops have been widely cultivated in the Senegal River Valley since the 1990s (SAED, 2005; 2006).

In Village T, a floodplain lies between the Senegal River and the national road. The other side of the national road is an underproductive sandy plain that has never been fertilized by flooding of the Senegal River or its tributaries. Village households are allotted cultivation rights to farmland plots on the floodplain to grow rice and tomatoes and plots on the sandy plain to grow tomatoes and other vegetables. Extended families are allotted rights to reclaim the uncultivated areas of the floodplain.

Almost every household head with cultivation rights in Village T, including female heads, is affiliated with the village's Peasant Organization. The Peasant Organization is run by the villagers and includes 166 registered members⁽⁷⁾. The main reason the villagers instituted the organization, and the reason they register as members, was to access credit from the National Bank of Agricultural Credit of Senegal (Caisse Nationale de Crédit Agricole du Sénégal: CNCAS). CNCAS only allocates funds to peasant organizations, not individual peasants. The Peasant Organization chooses cropping seasons (including rice cropping in the rainy and/or hot dry seasons and tomato cropping in the cold dry season) at a general assembly, which all members may attend, and at a gathering of executives of the Peasant Organization⁽⁸⁾.

FARMLAND UTILIZATION IN VILLAGE T AFTER THE INCREASED PRICE OF RICE

I. Exploitation of Farmland by the Peasant Organization of Village T

The price of paddy rice produced in the Lower Senegal River Valley increased along with international rice prices. This section evaluates how the sharp increase in rice prices affected farmland utilization of floodplain fields in Village T. First, it is important to provide an overview of the history of farmland exploitation and the allotment of cultivation rights in the village.

In 1980, a government development agency called the National Corporation of the Lands Development and Exploitation of the Senegal River Delta and the Senegal River and the Faleme Valleys (Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé: SAED) began large-scale exploitation and redistribution of paddy fields on the eastern side of floodplain of Village T (Fig. 2). It installed a large pump to divert water from the Lampsar River, a tributary of the Senegal River, to irrigation canals. SAED allotted cultivation rights for these exploited and redistributed plots to the household heads of Village T. During the next 20 years, other areas of paddy fields were not exploited. Young married men could not obtain any cultivation rights until they inherited it from their fathers.

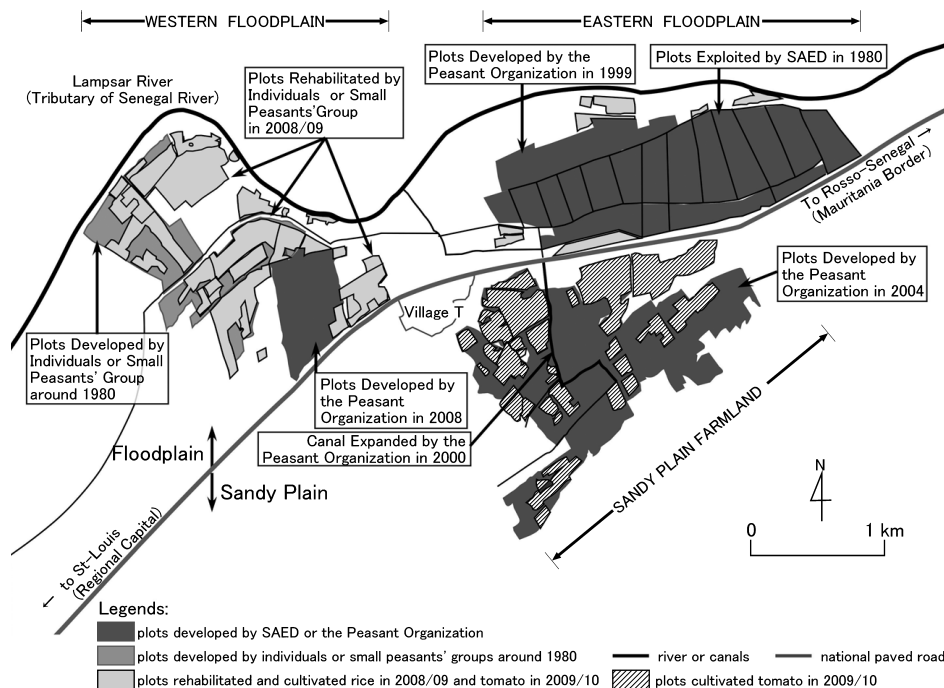


Fig. 2. Farmland Utilization in Village T.

Source: Field survey by the author (2004, 2006, 2008 & 2009).

In 1999, the Peasant Organization worked to remove this restriction. The organization created new farmland in the eastern floodplain and granted new cultivation rights to young married men who previously had none. Additionally, the Peasant Organization created and distributed new sandy-plain farmland in 2004 to grant cultivation rights for tomato production to young men. New eastern floodplain plots were allotted to 24 young married men, and new sandy-plain plots were allotted to 57 young men.

The location of each plot was determined using a lottery system. The allocation process differed for eastern floodplain and sandy-plain plots: for new floodplain plots, only young men who had been allotted new cultivation rights drew lots, whereas all members (those who previously had cultivation rights and those with newly allotted cultivation rights) were permitted to draw lots for the tomato cropping fields. Thus, the Peasant Organization re-allotted equal-acreage plots for all members.

In the same manner, in 2008, the Peasant Organization developed the western side of the floodplain and granted new rice cultivation rights to the 57 young men who had obtained cultivation rights for tomato cropping in 2004 (Fig. 2). Although these young men had already been registered as members of the Peasant Organization, which had provided them with credit for tomato cultivation, they had neither floodplain cultivation rights nor credit for rice production. Therefore, the Peasant Organization had decided to create new floodplain plots in western uncultivated land and grant the new cultivation rights.

The 2008 project differed from the 1999 and 2004 projects in important ways: while all of these development and allotment projects were initiated as a result of inequalities between the villagers with and those without cultivation rights, the 2008 project was backed by the GOANA and PNAR programs. One of the goals of the GOANA and the PNAR programs is to increase rice-cropping acreage, so the government made it easier for peasant organizations to access a loan for farmland exploitation or rehabilitation of irrigation facilities. The Peasant Organization in Village T had little difficulty acquiring a loan.

Another important difference was the diesel pumps that the Indian government provided to support the GOANA and the PNAR programs. The villagers in Village T obtained four of these diesel lifting pumps in 2008 at no cost; they set up these pumps along the Lampsar River and begun to irrigate the western floodplain plots. Previously, they had had to raise water using a few individually owned smaller pumps that were moved from one water-lifting point to another. The Indian lifting pumps could raise much larger volumes of water and could irrigate a wide section of western floodplain farmland more easily and reliably than was previously possible.

The exploitation and allotment projects of the floodplain fields in 1999 and 2008 and of the sandy plain in 2004 promoted an agricultural infrastructure and increased agricultural production capacity. The development of farmland and the allotment of cultivation rights, backed by the GOANA and the PNAR programs, could be considered bailout measures for young villagers with no cultivation rights who had been the more vulnerable households. They could also be considered corrective measures against inequality between villagers with and without cultivation rights. They allowed the villagers to build a firmer foundation for their livelihoods through collective efforts.

II. Farmland Re-utilization by the Peasants in Village T

Another noteworthy effect of the increased price of paddy rice was farmland re-utilization in western floodplain plots by households or private peasant groups other than the Peasant Organization in Village T. It is important to contextualize this issue within the history of the western floodplain fields.

Other than the farmland plots that households have been given the right to cultivate, extended families are permitted to reclaim land from the floodplain fields in Village T. Some families formed private peasant groups to jointly take part in reclamation and irrigation, but they usually abandoned those plots after cultivating rice or vegetables for several years. They said they were forced to abandon their plots because they could not obtain credit from CNCAS; unlike the Peasant Organization, their small peasant groups did not have access to these funds. Therefore, they gradually began to concentrate on and depend on rice cropping in eastern floodplain farmland because they needed to continue their costly farm management.

Despite a lack of credit, in 2008, western plots began to be re-cultivated properly as a response to the increases in international rice prices. Household heads who had exploited the western floodplain plots and had obtained cultivation rights

or who had inherited their fathers' cultivation rights resumed managing their western farmland plots after long years of abandonment by using their own resources rather than credit from CNCAS. One important aspect of the re-utilization of western floodplain farmland is that it reinforced the holistic foundations of the villagers' livelihoods, as did the development and allotment projects.

However, the real issue lies a little deeper. First, it is useful to examine some of the important features of the re-utilization within the context of the villagers' experience of the canal expansion to the sandy-plain farmland.

While irrigation was established for the farmland across the delta floodplain, the sandy-plain fields south of the national road were not irrigated because the national paved road blocked the way (Fig. 1). Therefore, sandy-plain fields in the Lower Senegal River could generally only be cultivated in the short 3-month rainy season. However, in 2000, the Peasant Organization managed to expand the canals to the sandy-plain fields by tunneling under the paved road. This canal expansion allowed the Peasant Organization to further expand canals and exploit newly irrigated sandy-plain fields in 2004, as described above⁽⁹⁾. Through this canal expansion, the Peasant Organization initiated their own rural development project, creating cash-earning opportunities and stabilizing the village economy.

Canal expansion allowed the villagers to expand their cropping options. Their cropping schedules used to be tight because tomato was originally cultivated only in the floodplain farmland, and only in the dry season when rice was not being cultivated. The expansion of irrigation canals to the sandy-plain fields enabled the villagers to cultivate tomato crops in the sandy-plain farmland and thus to choose farmland for tomato cropping from both the floodplain and the sandy plain when developing their annual cropping schedule. For example, the Peasant Organization planned to seed tomato in floodplain farmland in 2006/07⁽¹⁰⁾ after

Table 1. Farmland Utilization from 2004/05 to 2009/10

Seasons	2004/05			2005/06			2006/07			2007/08			2008/09			2009/10		
	Rice RS	Tomato	Rice DS	Rice RS	Tomato	Rice DS	Rice RS	Tomato	Rice DS	Rice RS	Tomato	Rice DS	Rice RS	Tomato	Rice DS	Rice RS	Tomato	Rice DS
Eastern Floodplain	●		●	●		●	●	●		●		●	○	▲	○	●		●
Western Floodplain	—	—	—	—	—	—	—	—	—	—	—	—	●		●		▲	
Sandy plain		●			●						●			○			●	

Rice Producer Price Increase

Rice Producer Price Collapse

Legends:

Rice RS: rice cropping in a rainy season

●: regularly cultivated farmland

○: irregularly no-cultivated farmland

Source: Field survey by the author (2004, 2006, 2008 & 2009).

Rice DS: rice cropping in a dry season

▲: irregularly cultivated farmland

—: farmland abandoned

tomato cropping in the sandy plain twice, in 2004/05 and 2005/06 (Table 1). As shown in Table 1, the villagers were able to juggle tomato cropping in the cold dry season and rice cropping in the hot dry season (although they could not juggle these crops when they used floodplain farmland for tomato cropping, as in 2006/07).

This example demonstrates how broadening their cropping options has allowed the villagers to create cash-earning opportunities and to stabilize the foundation of their livelihoods. The same may be said, no doubt, of the re-utilization project in western floodplain farmland in 2008. The villagers can now choose cropping farmlands from among the eastern and the western floodplain farmland and the sandy-plain farmland. In principle, they can choose what and where to plant in three areas of farmland throughout the year and at least cultivate rice or tomato during each season in one of the farmland fields. If they maximize all farmland plots, they can cultivate rice twice in the eastern floodplain farmland and twice in the western floodplain farmland, and cultivate tomato once in the sandy plain.

CROPPING STRATEGIES UNDER CONDITIONS OF AN INCREASE, FOLLOWED BY A COLLAPSE, IN RICE PRICES

As discussed in the previous section, the sharp increase in paddy-rice prices allowed the villagers to allot cultivation rights to young men by developing the western floodplain fields and to broaden their cropping options. This section focuses on their farming expenses and strategies for rice and tomato production after they expanded their cropping options following the increase in paddy-rice prices in 2008 and the collapse at the beginning of 2009.

The Peasant Organization of Village T reaches a consensus about the cropping schedule during the general assembly. Until 2007/08, members cultivated tomato crops in the floodplain biyearly or triennially for purposes of land restoration and soil fertility regeneration (Table 1). According to their agreed-upon annual cropping schedule, they were to cultivate tomato crops in sandy-plain farmland in 2008/09. In fact, they cultivated tomato crops in eastern floodplain farmland after only one-time tomato cropping in the sandy plain in 2007/08. In 2009/10, even though they were scheduled to cultivate tomato in the sandy plain, approximately half the members grew tomato in the western floodplain plots instead (Fig. 2). Thus, they did not completely conform to their regular annual cropping schedule in 2008/09 and 2009/10.

Why did the villagers change their formalized annual cropping schedule in 2008/09 and why did half of them choose to plant in the western floodplain fields in 2009/10 against their agreed-upon cropping schedule? It may be said that the actual cropping schedule was inefficient; in 2008/09 they could have cultivated rice in eastern floodplain farmland in the rainy and dry seasons. In addition, they could have cultivated rice in western floodplain farmland after the tomato harvest if every villager chose to cultivate tomato crops in the sandy-plain plots in 2009/10.

The principle reason why the villagers did not cultivate rice in the western floodplain in 2009/10 was that the downward trend in paddy-rice prices dimi-

nished their incentive to cultivate rice. Still, this does not explain why they did not cultivate rice in the eastern floodplain in 2008/09, but did in 2009/10. The reasons may be found by examining their farming expenses and farmland utilization for tomato cropping. Before beginning this analysis, it is important to outline the credit system for rice and tomato production.

I. Credit System for Rice and Tomato Production

The National Bank of Agricultural Credit of Senegal (CNCAS) offers agricultural credit to peasant organizations with a group-lending approach rather than to individual peasants. The money is loaned to the peasant organizations without any security, but members have a collective responsibility to repay all debt. If a peasant organization has a low repayment rate, they will not be granted further credit.

A peasant organization may apply for CNCAS credit based on agreement reached at its general assembly and executive meetings (Fig. 3). CNCAS determines whether the peasant organization will receive credit based on its past repayment rate. If approved, the amount of credit is calculated based on the total acreage members plan to cultivate. A peasant organization may stock up on input goods from private dealers and distribute these goods to members. In the case of rice production, during the rice harvest, the Peasant Organization in Village T informs each peasant of the amount of credit to be paid back. The members generally pay back the credit with paddy rice valued at 90 F CFA per kg. The Peasant Organization then sells this paddy rice to private merchants to raise cash and subsequently repays the CNCAS with this cash.

The credit system for tomato production differs from that for rice production. In the case of tomato production, before applying for CNCAS credit, a peasant organi-

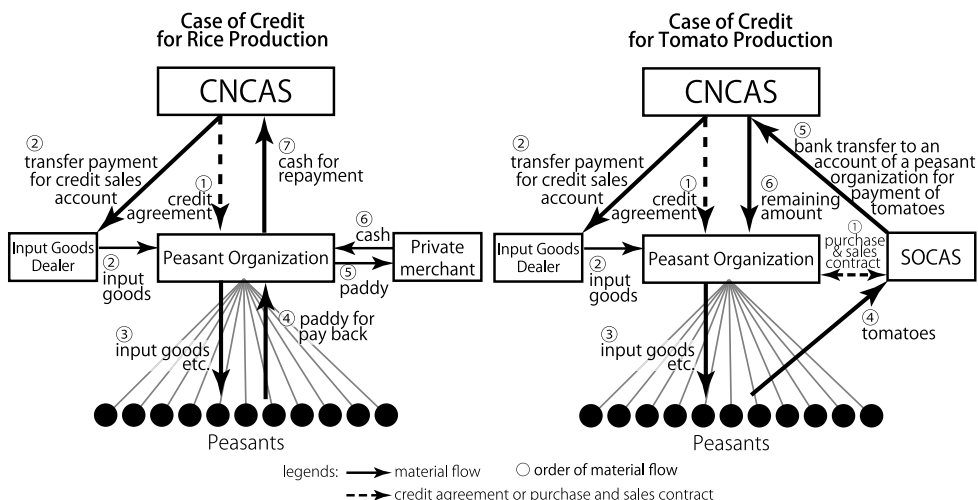


Fig. 3. Flow Chart of Credit and Repayment System.
Source: Field survey by the author.

zation must sign a contract with Senegal Canned Food Company (Société de Conserves Alimentaires au Sénégal: SOCAS), the biggest whole-tomato canning company in Senegal (Fig. 3)⁽¹¹⁾. SOCAS reaches an agreement on the acreage for tomato planting with each peasant organization and agrees to purchase all tomatoes harvested by that organization members. SOCAS now purchases all the tomatoes used in its cans of whole tomatoes from peasant organizations in the Lower and the Middle Senegal River Valley through purchase contracts with these organizations.

However, individual members within a peasant organization are subject to a level of risk. Each peasant organization has a bank account with CNCAS, and

Table 2. Farming Expenses of Rice and Tomato per Member*

Season of survey	2009/10 Rainy Season Rice (n=83) average=1.22 ha		2009/10 Cold Dry Season Tomato (n= 104) average=0.62 ha	
	F CFA/member	%	F CFA/member	%
Gross Income** (A)	245,060		304,459	
Input Cost (B=C+F)	502,310	100.0	303,015	100.0
Credit by CNCAS (C=D+E)	386,296	76.9	262,932	86.8
Credit for cultivation (D)	272,218	54.2	166,076	54.8
Plowing, Ridging	51,747	10.3	24,349	8.0
Seeds, Fertilizers, Agrichemicals	149,666	29.8	107,793	35.6
Energy for lifting pump	41,479	8.2	20,720	6.8
Others	13,070	2.6	3,538	1.2
Interest (6%)	16,296	3.2	9,676	3.2
Others (E)	114,078	22.7	96,856	32.0
Membership due	8,991	1.8	1,556	0.5
Irrigation tax	15,682	3.1	3,617	1.2
Amortization***	63,826	12.7	4,121	1.4
Arrear	25,579	5.1	87,562	28.9
Other Input Cost**** (F)	116,014	23.1	40,083	13.2
Employment	58,992	11.7	40,083	13.2
Husking or Combining*	45,485	9.1	—	—
Transport	11,537	2.3	—	—
Net Income (G=A-B)	-257,250		1,444	

Source: Field survey by the author (2009), Credit account ledger of Peasant Organization of Village T (2009).

Note: * With random sampling method, I withdrew 83 members of the Peasant Organization of Village T who cultivate rice-paddy for farming expenses survey in the rainy season, and 67 members of them who also cultivated tomato in the cold dry season. The random samples for tomato farming expenses also include 31 members who did not cultivated rice-paddy in the rainy season, and 6 female villagers of women's groups.

** Gross income is converted from harvested paddy into cash at the rate of 4,000 F CFA per kilogram, the average price of producer price in 2009/10 on the assumption that the samples sell all harvested paddy. I calculated hire charges for the husking, combine, and transport, which are paid in paddy in the same fashion. Gross income for tomato production is calculated at 51.5F CFA/kg, the price contracted between SOCAS and peasant organizations.

*** Amortization is devoted to repayment of the loan which the Peasant Organization of Village T acquired for the development or readjustment of farmland.

**** Input cost here does not include cost depreciation.

SOCAS pays its cash for tomatoes into this account. CNCAS deducts the amount of the credit, including any arrears, from these payments. A peasant organization, therefore, receives money only when it is able to repay its entire debt; the peasant organization withdraws any profit and distributes it to members, but only after the repayment rate reaches 100%.

The CNCAS system is risky for members, but the credit is absolutely necessary for peasants; rice and tomato production are both very expensive. For members of the Peasant Organization in Village T, CNCAS credit covered 76.9% (386,296 F CFA) of the total farming expenses for rice and 86.8% (262,932 F CFA) for tomato in 2009/10 (Table 2). Because the credit is so essential, members of the Peasant Organization must maintain a high repayment rate and retain access to credit through various collective efforts (Takahashi, 2009: 7–10).

II. Farming Expenses of Rice and Tomato

Clearly, members of a peasant organization must ensure consistent repayment to maintain access to credit. This section explores farmland utilization for tomato cropping, specifically with regard to farming expenses under the credit system.

Of all farming expenses, input goods such as seeds, fertilizer, and agrichemicals are always most costly (Table 2); in Village T these accounted for 29.8% (149,666 F CFA) of the rice farming expenses and 35.6% (107,793 F CFA) of the tomato farming expenses. To reduce total input cost, peasants have no alternative but to cut the cost of fertilizers and agrichemicals because it is extremely difficult to cut other input costs. They continue to spend equivalent amounts on other input goods because they believe that reducing input goods will decrease the harvest yield.

In Village T, arrears in rice farming expenses, which was the second-greatest tomato farming expense (28.9%), were attributable to the rice production in the dry season of 2008/09 and the rainy season of 2009/10. Although the Peasant Organization harvested 77.9% of the paddy rice necessary to repay their debt in 2008/09, it was unable to sell this paddy rice to private merchants. During the rice-cropping season of 2009/10, the Peasant Organization requested that members repay their debt to the organization in cash rather than paddy rice because the Peasant Organization already had a vast stock of unsellable paddy rice in storage. The members were only able to repay 63.0% of the total debt to the Peasant Organization in cash. This was due in part to the poor harvest in 2009/10. In addition, the members were unable to sell the paddy rice to private merchants because paddy rice was not yet in high demand in the domestic rice market. The two rice-cropping seasons before the tomato-cropping season in 2009/10 resulted in massive arrears to the Peasant Organization: 13,723,109 F CFA.

Consequently, in 2009/10 the Peasant Organization decided to limit its tomato cropping acreage covered by CNCAS credit in order to reduce its collective credit. The Peasant Organization entered into an agreement with SOCAS to sell tomatoes cultivated on 30 ha (0.2 ha per member)⁽¹²⁾.

This decision resulted in a dilemma: although members of the Peasant Organization collectively needed to produce more tomatoes and earn enough to repay the full debt, they were obliged to cultivate tomatoes on very little acreage. Unfor-

unately, the villagers were very unlikely to be able to use their own money to add to their allotted 0.2 ha for tomato cropping in the sandy-plain farmland due to the limited total acreage of the sandy-plain farmland and the limited number of diesel lifting pumps. Therefore, the Peasant Organization could not expect to discharge its liabilities and acquire credit in the coming seasons from CNCAS, which bases its approval of credit on past repayment rates. Within this context, almost half the members of the Peasant Organization decided to plant tomatoes in the western floodplain farmland. Tomato production in floodplain farmland produces better harvests and more income than does tomato production in the sandy-plain farmland due to the superior soil fertility and water retention.

As a result, tomato cropping in 2009/10 resulted in a total gross income of 36,079,973 F CFA to the Peasant Organization. The Peasant Organization needed to repay a total debt of 34,705,885 F CFA from tomato production and the arrears from the past two rice-cropping seasons. Therefore, on average, members received little gross income from the tomato cropping in 2009/10 (Table 2)⁽¹³⁾. As shown in Table 2, the deficit from the last rice cropping in 2009/10 meant that the massive arrears took a great portion of members' total expenses and reduced their earning power.

However, it would be more accurate to say that they dipped into the benefit from tomato production to cover the deficits related to rice production. This is because they cultivated rice in the dry season of 2009/10 despite the huge deficit from the rainy season of 2009/10 and the reduced earning power in the tomato-cropping season. If they simply regarded rice as a gainful crop, their cropping calendar would appear unreasonable because reliance on rice production alone increases the risk of using the profits from tomato production under conditions of an unstable and uncertain domestic rice market. However, the members cultivated rice twice in 2009/10 despite the rice price collapse because they did not plan to cultivate rice in 2010/11 and wanted to secure a whole year's worth of rice for their own consumption.

Additionally, considerable evidence demonstrates that tomato production benefited the village by covering the deficits related to rice cropping; the villagers could sell harvested tomatoes more reliably than they could sell the harvested rice.

As discussed above, the peasants need contracts with SOCAS to sell tomatoes. However, the villagers were able to increase their tomato-cropping acreage using their personal funds because SOCAS actually purchased all harvested tomatoes, with or without a contract. During the tomato-harvest period, cargo trucks came to the tomato fields and automatically conveyed cases of tomatoes to the SOCAS factory. Moreover, the villagers were able to sell tomatoes at a fixed price that had been set in the purchase contract: in 2009/10, the price was 51.5 F CFA per kilogram. They did not have to find private merchants, research tomato prices, bargain with merchants over prices, or worry about the risk of tomato-price collapse. Therefore, peasants were able to anticipate more steady and secure income from tomato production than from rice production.

The most likely explanation for their cropping strategy is that they grow rice for their own consumption and tomatoes as a reliable source of profit. In other words, tomato production allows them to cover the deficit associated with rice

production when they are unable to sell the rice or have a poor harvest, and therefore ensures future credit. From this perspective, it makes sense that members chose to plant tomatoes rather than rice in the eastern floodplain farmland in 2008/09 despite the increased price of paddy rice (Table 1).

The villagers also began larger-scale cultivation of a variety of vegetables that they had grown along the canals on a smaller scale during tomato cultivation. They expanded the crop acreage for these vegetables in expectation of increased cash income. In 2009/10, they cultivated 5 ha of onion, 2 ha of zucchini, 1 ha of solanaceous crop (*Solanum aethiopicum*)⁽¹⁴⁾, and other vegetables. It was not easy for them to expand crop acreage and increase their income because they did not receive CNCAS credit for these vegetable crops.

The villagers were careful to research the price of various vegetable crops. For example, many villagers grew onion because the government keeps the producer price for onions stable through import control. They also grew zucchini and a solanaceous crop in 2009/10 because the producer price for these crops rose significantly in 2008/09. However, because so many peasants in other villages in the Lower Senegal River also cultivated these crops in response to the high 2008/09 prices, the producer price for zucchini and a solanaceous crop declined in 2009/10. To put in the other way round, peasants in villages other than Village T were clearly also attempting to cultivate more profitable vegetables.

Additionally, some villagers in Village T began to mainly cultivate a solanaceous crop in sandy-plain farmland immediately after the tomato harvest. They made this choice because, owing to the canal expansion in 2004, the sandy-plain farmland in Village T can be irrigated to cultivate a solanaceous crop in the dry season, unlike sandy-plain farmland in other villages in the Lower Senegal River Valley. Therefore, they expected that production of solanaceous crops would be reduced, and consequently, the producer price would rise during this period. In conjunction with the fact that they knew they could earn little cash from tomato production in 2009/10, they decided to try to earn money on cash crops by exploring various farmland applications. Currently, villagers in Village T concentrate on tomato cultivation, or more precisely, on vegetable cultivation, based on tomato cultivation for which they can access CNCAS credit.

CONCLUSIONS

The GOANA and PNAR programs and the increased price of rice resulted in the 2008 farmland exploitation and cultivation-rights allotment project, in which the Peasant Organization of Village T played a central role. The Peasant Organization easily obtained a loan from CNCAS to exploit the western floodplain because one mandate of the GOANA and PNAR programs was to expand the acreage of rice-paddy fields. The loan allowed the Peasant Organization to create new farmland and to grant new cultivation rights for rice production. In addition, the increased price of rice led some villagers to re-utilize abandoned farmland. These projects allowed the villagers to generate income-producing opportunities and strengthen the foundation of their livelihoods.

The villagers chose not to cultivate rice in the eastern farmland in 2008/09 when the producer price of paddy rice increased sharply, but instead cultivated rice in 2009/10 when the producer price dropped. The analysis of their cropping strategies in 2008/09 and 2009/10 revealed that the villagers tended to favor tomato cultivation in the floodplain. These cropping strategies indicate that they viewed rice as a subsistence crop rather than a main cash crop and that they saw tomato as a main cash crop because they could turn a profit on tomato production more reliably than on rice production. In addition, they could use the profit from tomato production to cover the deficit from previous rice crops. This strategy ensured they could cover a rice production deficit in case they were unable to sell the rice crop or had a poor harvest, and they could therefore ensure the continuation of their future credit, as exemplified by the tomato cropping in 2009/10.

Kofi Annan, Chairman of the Board of the Alliance for Green Revolution in Africa (AGRA), said in his opening remarks at the second CARD general meeting, "When Africa's farmers are given the chance ... they are eager to take advantage of the opportunity and they can produce remarkable results" (Annan, 2009). Reducing dependence on rice import and achieving national food security will certainly require supportive measures that can lead to the creation of opportunities for rice production, e.g., improving rice production through irrigation systems, ensuring a stable supply of input goods, stabilizing producer prices, and providing agricultural credit.

However, this view is quite unsatisfactory. In fact, this empirical analysis of farmland utilization and cropping strategies in Village T revealed that first, African peasants do not always cultivate rice when they are given the chance, and second, African peasants are not always just waiting to be 'given the chance.'

The data from this study do not indicate that peasants in the Senegal River Valley would plant rice, even if the Senegalese government or international aid agencies promote land for rice cultivation and expand rice-paddy acreage. Villagers might choose not to plant rice due to some unfavorable conditions such as turbulence in the rice market, instead choosing to plant other crops that enjoy better market conditions. They realize that rice cropping is just one cropping option, although they are unlikely to abandon rice cropping entirely because rice is their dietary staple and essential to ensure their own food security.

By the same token, the villagers in Village T were not passively waiting to be 'given a chance,' as is the common assumption about African peasants. This case study has shown that these villagers had planned several alternatives and applied these options under specific political, economic, or social conditions. While the peasants in Village T developed rice-paddy fields after the price of paddy rice increased sharply, they sought out new effective opportunities for increased earnings after the collapse in paddy-rice prices, such as tomato, onion, and other vegetable crops. These broadened cropping options were made possible through their own exploitation and re-utilization of farmland and their own expansion of canals. By enabling several cropping options, they can both ensure their own food security and increase their cash-earning ability.

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NOTES

- (1) For example, a dish of stewed rice and fish with consommé soup, called “ceeb jén” (ce:b jén in Wolof; literally stewed rice [ceeb] and fish [jén]), is now regarded as the national cuisine of Senegal (Cusack, 2003).
- (2) Le franc de la Communauté Financière Africaine (F CFA) used to be pegged to the French franc at the exchange rate of 100 F CFA per French franc, and is now pegged to the euro at the exchange rate of 655.957 F CFA per euro. One dollar is equivalent to 480.2 F CFA at the exchange rate in November 2010.
- (3) The Senegalese government implemented the GOANA program as the annual agricultural program of 2008/09. The government continued to implement “GOANA II” for 2009/10 and “GOANA III” for 2010/11.
- (4) The sharp increase in international rice prices did not reflect the PNAR program (implemented in October 2006), but it evidently allowed the government to revise and re-implement the PNAR program in December 2007.
- (5) Whereas the price of rice in Senegal’s domestic market and the global market remain higher than the average price in 2007, prices of rice produced in the Lower Senegal River Valley fell below the average price prior to the increase in rice prices. This trend, which differed from other trends in domestic and global markets, is an important subject that requires careful analysis, but it lies beyond the scope of this paper.
- (6) Growing food insecurity in African countries today is attracting the attention of the international community (cf. FAO, 2009a). For example, the Coalition for African Rice Development (CARD) Initiative, proposed by the Japan International Cooperation Agency (JICA) and the Alliance for a Green Revolution in Africa (AGRA) in 2008, has established partnerships with many agencies including the Food and Agriculture Organization, the World Bank, the Africa Rice Center, and others (JICA & AGRA, 2008).
- (7) At the time of my research, the members of Village T included 115 male heads of household, four female heads, 15 male and one female non-household heads, and 29 male and two female non-residents.
- (8) The executive committee of the Peasant Organization of Village T is composed of a president, vice-president, secretary general, treasurer, treasurer for credit, secretary, and a credit and farmland improvement management representative. They are elected by the members and work on a volunteer basis. They work mainly to manage the treasury funds from CNCAS to the Peasant Organization, manage farmland, control irrigation water, and serve as a contact point for international aid agencies.
- (9) This innovative idea of the villagers to irrigate vegetable fields was the first trial of its kind in the Senegal River Valley; communities in other areas are now applying this model and are working to expand their canal network by tunneling under the paved

- road.
- (10) The agricultural calendar in Senegal runs from July to June.
 - (11) However, peasants who harvest tomatoes under contract are not required to sell all tomatoes to SOCAS. They may also sell tomatoes to other private merchants, but they are more likely to sell to SOCAS than to private merchants.
 - (12) Before 2009/10, they cultivated tomatoes on 30.8–81.2 ha.
 - (13) Some villagers made a profit on tomato production in 2009/10; their profits compensated for the shortfall of other villagers' repayments. This aspect of compensation for repayment shortfall is an interesting subject. I have discussed credit repayment for rice in a previous paper (Takahashi, 2009), but it lies beyond the scope of this paper, and I will explore it in a later work. Although the villagers were unable to make a profit after the tomato harvest, they optimistically hope to get money someday.
 - (14) *Solanum aethiopicum*, a species of solanaceae, called “*xuluñe*” (xulupe) in Wolof in St. Louis region, “*jaxatu*” (jaxatu) in Wolof or “*aubergine amère* (bitter eggplant)” in French in Senegal, is grown throughout Sub-Saharan Africa and South America.

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